NASA TECH BRIEF

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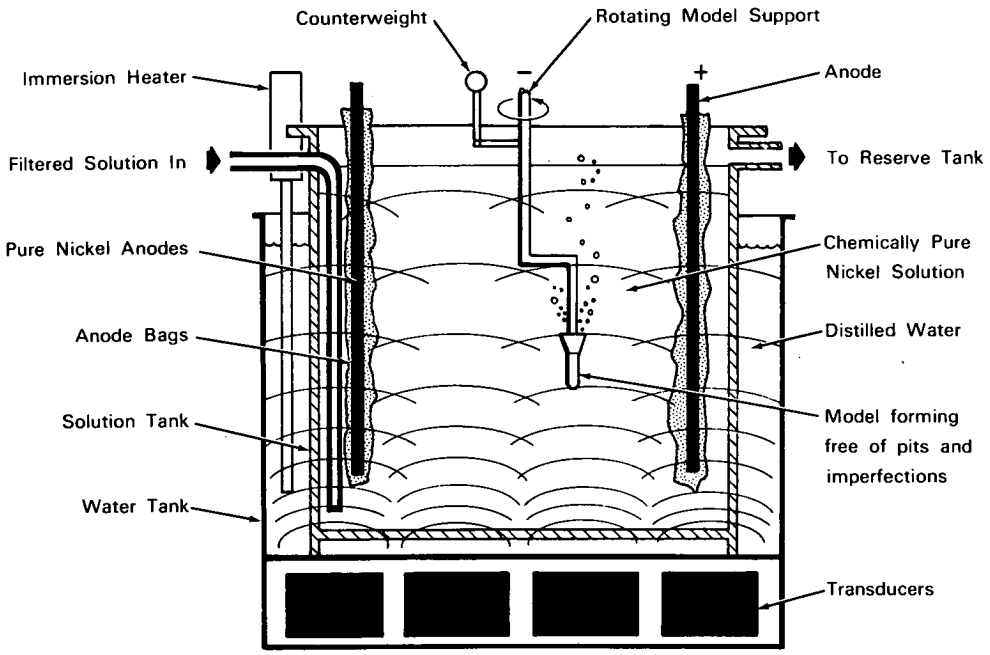
High Purity Electroforming Yields Superior Metal Models



The problem: Making small models using very high purity metal to meet the exacting demands of heat-transfer research in studies of missile nose cones and spacecraft.

The solution: An ultrasonic electroforming process that produces coatings which are smooth, pit-and-pore free, and homogeneous.

How it's done: Plating equipment used in this process is equipped so that there is continuous ultrasonic agitation of the plating bath. The cathode is in rotary or reciprocating motion while electroforming is taking place and the plating bath is continuously skimmed and filtered.

The plating bath, held in a plastic tank, is immersed in a tank of distilled water which is warmed by immersion heaters. Ultrasonic agitation is obtained by operating barium titanate transducers in the base of the water tank. Tests show that ultrasonic agitation minimizes polarization at the cathode and thus permits higher current density and speeds up the elctroforming process.

Solution used is a standard Watts nickel bath made with C. P. chemicals and distilled water. Anodes are nickel 99.9 per cent pure, rolled and depolarized. They are covered with anode bags made of Dynel cloth. The filter is coated with activated carbon.

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Ultrasonic electroforming has proven successful in making pure metal models for accurate heat-transfer testing in wind tunnels utilizing high-velocity gases. Before this process was developed, pure nickel models could not be obtained with conventional processes. Most were useless because of pits, pores, or contamination with undesired metals.

Notes:

1. Almost any type of electroforming can be accomplished with the ultrasonic method. It is also well adapted to plating jobs where a heavy build-up of plating, free of pits and dirt pores, is specified.
2. In production work, the process is excellent for high-speed deposition. Where thin coatings are required, the process produces a denser deposit in less time than presently required.
3. Metals such as copper, gold, silver, and others can be employed for plating. Specific applications include thin coatings such as used in the automobile industry, plating of surgical equipment, and chemical processing machinery.

Patent status: NASA encourages the immediate commercial use of this invention. It was invented by NASA employees and a patent application has been filed. Inquiries concerning license rights may be made directly to the inventors, Mr. John P. Houston or Mr. Robert M. Haefeli.

Source: Ames Research Center (ARC-6)